Brookhaven National Laboratory

NATURAL RESOURCE MANAGAMENT PLAN

ANNUAL REPORT

CALENDAR YEAR 2004

1.0 Introduction

This document summarizes activities carried out under Brookhaven National Laboratory's (BNL) Natural Resource Management Plan (NRMP) during calendar year 2004. All activities carried out under the NRMP during CY2004 will be discussed and the report will facilitate development of summary information for the Site Environmental Report for 2004.

2.0 Comprehensive Natural Resource Management Plan

The Laboratory completed and issued the Comprehensive Natural Resource Management Plan in December 2003. The development of this plan was carried out over several years with the assistance of the Technical Advisory Group (TAG) that was established to provide input to the Natural Resource Program and the Upton Ecological and Research Reserve.

This report discusses work related to actions established within the NRMP. The NRMP is a living document that will change based on the concept of adaptive management. As new information is gained and the understanding of the ecological processes within the Pine Barrens ecosystem in which BNL is situated improves, changes to the NRMP will be made. Incremental changes will be incorporated annually with the completion of the required Annual Report. All incremental changes will be addressed during the 5-year re-write of the Plan.

To facilitate updating and changing actions, each Annual Report is submitted to the TAG for review and comment. Input from the TAG will be accepted and considered for incorporation into the action items list. Currently the Action Item list consists of 65 actions (57 original actions plus 8 new actions identified in the CY2003 Report) that will be discussed in this Annual Report.

3.0 Progress

3.1 Transition Wildlife Management Plan Actions into NRMP

This was completed in December 2003 with the publishing of the current NRMP.

3.2 Annual Summary Report

An annual summary report for calendar year 2003 as required under the NRMP was written as part of the Internal Self Assessment program of the Environmental & Waste Management Services Division. The annual report for calendar year 2003 was completed by the March 31, 2004 deadline established in previous reports. The CY 2003 report was also submitted to the TAG for Review.

3.3 TAG Review of Annual Report

The CY2003 report on the former Wildlife Management Plan (WMP) and draft NRMP was submitted to the TAG for review during its spring meeting with a request for comments and suggestions. The TAG did not have any comments on the report. The CY2004 report will be sent to the TAG with a request for comment. Comments on annual reports are to facilitate changes in the program other than those that have been identified over the past year. In addition the TAG review may result in modification to changes suggested by the Natural Resource Manager during the writing of the Annual Report.

3.4 Adaptive Management Cycle

The current report is the second Annual Report in the Adaptive Management Cycle. It is not expected to result in a need for significant changes. As actions identified in the NRMP are implemented, monitored, and reported on in the future, the need for change will be identified.

3.5 Improve Decision Making through use of Innovative Tools

The use of global positioning systems (GPS) and geographic information systems (GIS) are important tools for managing various aspects in Natural Resource Management. Several new or modified layers were added to the GIS during 2004. In addition, a new GIS-based technique for estimating the white-tailed deer population was developed. Improvements were made to the layers for deer transects, invasive species, and the vegetation map.

The natural resource GIS analyst also developed and presented posters at an Environmental Systems Research Institute (ESRI) conference in California and at the Pine Barrens Research Forum held annually at BNL. Student interns utilize GPS and GIS during the development and reporting on projects. Data are maintained in a centralized location for future access. Projects using the GIS and/or GPS include tiger salamander and marbled salamander larval and metamorph surveys, hognose snake, box turtle, and spotted turtle radio telemetry surveys, Odonate (dragonfly and damselfly) surveys, vernal pool water chemistry studies, and documentation of species locations for random sightings.

3.6 Maintain and Improve Relationships with Stakeholders

Through the TAG, Community Affairs, and other interactions BNL is maintaining a positive relationship with its stakeholders. The Natural Resource Manager for BNL participates with the Long Island Pine Barrens Joint Policy and Planning Commission (Pine Barrens Commission) committees to share knowledge and experience to assist in the sound management of the Pine Barrens. Working through the TAG several agencies or groups provide input to natural resources issues at BNL. Through presentations to the Citizens Advisory Council and the Brookhaven Executive Roundtable stakeholders are kept updated on plans and initiatives concerning natural resource management and are afforded an opportunity to provide input.

Through the Natural Resource Management Program, BNL has been made accessible for actions by NYSDEC including trapping of wild turkeys to establish new populations in eastern Long Island. Banding programs to identify Canada geese breeding at BNL, and capture and protection of the banded sunfish prior to and during the Peconic River restoration project have served to improve and solidify a positive working relationship between NYSDEC and BNL.

The Upton Reserve serves to maintain relationships between BNL, DOE, and the U.S. Fish & Wildlife Service through continued cooperation in the management of the Upton Reserve and funded research, while developing the transition of Upton Reserve management and research to a new not-for-profit foundation. As the Department of Energy funding was reaching its agreed end date, the DOE, Pine Barrens Commission, and the Laboratory worked to establish a not-for-profit organization to carry-on the work of the Upton Reserve. The Foundation for Ecological Research in the Northeast (FERN) was incorporated in New York on Nov. 25, 2003 and has been working to identify funding sources throughout CY2004. FERN's board of directors represent interests of BNL, The Nature Conservancy, Stony Brook University, and Dowling College with board seats for up to 15 members. By year's end funding for CY2005 had been secured in the amount of $125,000. FERN and the Natural Resource Program at BNL are closely allied to ensure sound operation of the Upton Reserve and to encourage the use of the Reserve and BNL for ecological research.

3.7 Peconic River Flow Monitoring

Peconic River flow is measured at several locations including above the outfall (HE), down river at the East Firebreak (HMn), and near the boundary of the Laboratory (HQ). In addition flows from the central wetlands are monitored before they enter the Peconic River station at the East Firebreak (HMs), and flows from the STP are measured prior to discharge into the Peconic River. Flow data is presented in Figure 1. In May 2004 the Peconic River flows were diverted from just below the STP outfall to an area downstream and off site of BNL in order to conduct the on site portion of the Peconic River environmental remediation project. Flows were not restored to the river until late in the year. High groundwater maintained limited flow throughout the year even with diversion of the river.

3.8 Water Quality Monitoring

Water quality is monitored as a requirement of BNL's State Pollutant Discharge and Elimination System (SPDES) permit. Water quality is measured at various outfalls including the STP discharge to the Peconic River and at several recharge basins that receive stormwater and/or once through cooling water. Results are reported to the NYSDEC on a monthly basis and summarized in the Site Environmental Report each year. The Site Environmental Report may be viewed via the Internet at http://www.bnl.gov/bnlweb/SER/2003_SER.html. Sampling in 2004 did not indicate any concerns for threatened or endangered species within basins or the Peconic River.

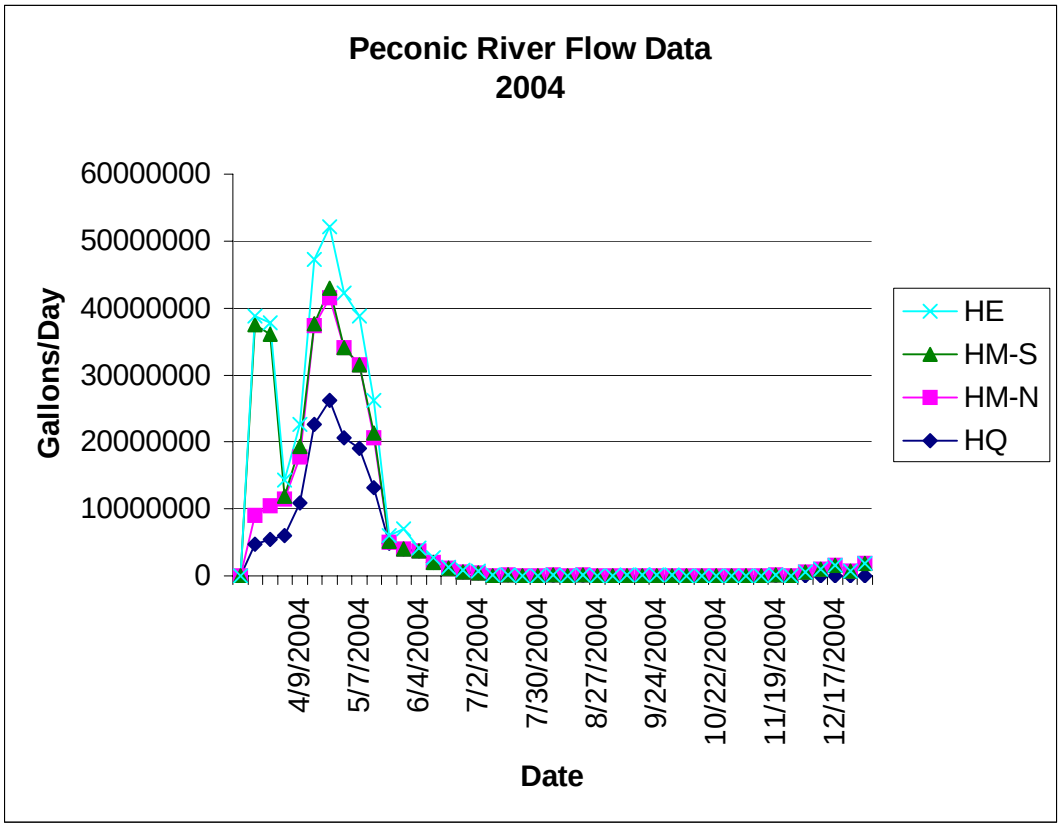

Figure 1. Peconic River flow data for 2004.

3.9 Fish Sampling Peconic River

Fish sampling under the Environmental Monitoring Plan was suspended beginning in 2001 to allow the fish population within the Peconic River to recover. Annual population monitoring has been completed since 2001 to document progress of the recovering population (Table 1). In general the population of the seven species sampled has not increased since destructive sample was stopped in 2001. In addition the average size of each species has decreased (Table 2) indicating that reproduction is occurring, but is limited. The decrease in population and average size is likely due, in part, to the severe drought that occurred during the spring through fall of 2002. Every water body on BNL, that is dependent on groundwater, dried up including large sections of the Peconic River. This along with the sediment trap placed just above the gauging station at the east

boundary has limited the movement of fish upstream for re-colonization of the onsite stretches of the Peconic River.

In 2004, prior to the start of the Peconic River remediation project, a search for banded sunfish took place during which four fish samples (three chain pickerel and one pumpkinseed) were obtained for analysis. These were the only fish samples taken due to small fish size and lack of sufficient fish population to take additional samples. No census was kept on captured fish directly. However, most fish that were captured prior to and during the onsite portions of the remediation project were released downstream of the gauging station at the east boundary of the Laboratory. A total of 147 banded sunfish were captured from the on site portions of the river and release in a protected pond. As the river restoration is completed these fish and/or their offspring will be captured and re-introduced to the river. Additional banded sunfish from the off site portions of the river undergoing remediation were also captured and released in the protected pond.

Because fish populations have not recovered and the clean up of the onsite portions of the river has resulted in many fish being removed from the on site portion of the river, the moratorium on destructive sampling under the Environmental Monitoring Plan will be maintained for up to three more years.

Interestingly, chain pickerel have been found as far upstream as the wooded wetland next to the Current Landfill located in the east central section of the Lab. Brown bullhead catfish have been found within the RHIC ring ponds. The ponds near the current landfill are connected to the Peconic River via a series of mosquito ditches that were created during WW I and/or WW II and the Peconic River begins flows west of the RHIC ring. Continued high ground water level and heavy flows from spring rains in 2004 allowed sufficient access for the pickerel and brown bullheads to be maintained in the upstream portions of the onsite wetlands associated with the Peconic River. Although one option may be treatment of the ponds to remove fish for the protection of the tiger salamander, BNL would prefer to let the presence/absence of fish in these areas to be cyclic with changes in hydrology and weather patterns. In addition water control structures at strategic locations may help to prevent fish from entering tiger salamander habitat in the future.

Table 1. Three-year population assessment of Peconic River fish (2001 – 2003).

	Banded Sunfish			Brown Bullhead			Chain Pickerel			Creek Chubsucker		
Peconic River Location	Number of Fish in Each Section											
Year	**2001**	**2002**	**2003**	**2001**	**2002**	**2003**	**2001**	**2002**	**2003**	**2001**	**2002**	**2003**
Downstream of HMn*	4	1	1	7	1	4	7		11	26	1	9
HMn Flume	14						6		9	6		
Upstream of HMn				36	12	2	7	1	2	21	3	2
Total Counted	18	1	1	43	13	6	20	1	22	53	4	11
	Golden Shiner			Largemouth Bass			Pumpkinseed					
Downstream of HMn*		1	5	1			11	19	3			
HMn Flume							2		6			
Upstream of HMn	9	22	3				2	58	29			
Total Counted	9	23	8	1	0	0	15	77	38			
Note: * HMn is the name identifying the monitoring station located at the east firebreak.												

Table 2. Average size of fish sampled from the Peconic River (2001 – 2003)

	Banded Sunfish			Brown Bullhead			Chain Pickerel			Creek Chubsucker		
Peconic River Location	Average Length in Inches											
Year	**2001**	**2002**	**2003**	**2001**	**2002**	**2003**	**2001**	**2002**	**2003**	**2001**	**2002**	**2003**
Downstream of HMn*	2.63	2.13	1.50	4.36	4.00	3.12	6.68		6.93	4.30	2.25	2.23
HMn Flume	2.86						6.54		7.13	4.46		
Upstream of HMn				5.26	6.23	1.50	13.00	7.89	5.57	4.35	2.58	4.63
	Golden Shiner			Largemouth Bass			Pumpkinseed					
Downstream of HMn*		1.25	1.6	5.50			3.59	2.15	4.08			
HMn Flume							3.63		3.46			
Upstream of HMn	4.39	1.82	0.96				5.75	1.60	3.57			
Note: * HMn is the name identifying the monitoring station located at the east firebreak.												

3.10 Deer Management

The need for deer population management continues to be an issue for BNL. Discussions on various deer management issues are provided below.

3.10.1 Issue and Decision Paper on Deer Management

In 2003 a decision was made to delay the submittal of an Issue and Decision paper to upper management in order to work on the issue of deer overpopulation on a Regional scale. Investigation into a Regional approach resulted in few political entities wanting to deal directly with the issue due to its controversial nature. However, NYSDEC has worked to expand hunting seasons and take limits to be as liberal as possible under existing regulations. Region 1 staff also consistently work with local land owners wanting to reduce populations by issuing permits under their Deer Management Assistance Program. Effective management of deer will continue to be an issue that at some point must be addressed not only by the Laboratory but also local landowners, the state, county, and towns.

3.10.2 Environmental Assessment for Deer Management

The Environmental Assessment for deer management is dependent on the approval of the issue and decision paper. Since a regional approach for deer management is likely not to occur the Laboratory should go forward with making decisions concerning deer management. However, current budget scenarios will likely prevent the funding of any management with significant costs. Once an issue and decision paper is finalized and approved, the need for an EA can be re-evaluated.

3.10.3 Implement Deer Management

Implementation of deer management is in part delayed by the need for an Environmental Assessment. However, establishment of deer hunting on site should not require an EA since hunting is an action governed by NYSDEC rules and regulations. Should BNL decide to establish a hunting program, work toward this end could begin almost immediately.

3.10.4 Deer Population Estimation

Through work initiated by the Upton Ecological and Research Reserve (Upton Reserve) an aerial infrared population census was conducted for the white-tailed deer population on BNL, Wertheim National Wildlife Refuge, and Rocky Point Wildlife Management Area. The results of this census showed a physical count of 412 deer onsite and immediately offsite of BNL, Wertheim NWR had 231, and Rocky Point had 314. The data collection allowed a comparison between non-managed populations, BNL and Wertheim NWR, and managed populations, Rocky Point.

Rocky Point Wildlife Management Area is approximately the same size as BNL, 5200 acres vs. 5,265 acres. The population estimate for BNL based on the 84% accuracy of the aerial flyover and removal of deer not actually on site at BNL is 446 deer. The Rocky Point area would have an estimate of approximately 374 deer. These numbers indicate that existing population estimating techniques are not as accurate as they should be. Under the methods that BNL was using at the time the aerial survey was taking place the deer population was estimated at 1302 deer. Therefore, the process of conducting the surveys and estimating the population was reviewed and changes made.

Under the former method deer were counted along three separate transect routes and each route was counted three times resulting in nine data sets. The data were then averaged for the acreage covered on the transects to get the number of deer/acre. This was then used to estimate the population on site by multiplying the value by the total acreage of BNL. It did not take into consideration overlaps in the three transects or the non-uniform distribution of deer across the site.

The new method utilizes the same three transects, which have been modified to remove any overlaps. Deer are counted and their location and habitat noted on BNL's vegetation map. The data is then analyzed to determine the number of deer within each habitat type on each transect to calculate the number of deer/acre/habitat type. These values are then used to calculate the number of deer/habitat type across the Laboratory. The results of these modification and use of the GIS are comparable to estimates generated by the aerial survey. The aerial survey estimate for BNL was 446 where the new ground-based methodology resulted in an estimate of 497 deer. Fortunately, past deer surveys utilized maps for marking the location of deer along the various transects. These data were cleaned up to remove redundancies from overlaps, then the data were overlaid on the vegetation map and new estimates developed. Figure 2 is shows the population trend using the old methodology and is compare to Figure 3, which shows the population trend using the new methodology. Both methods show the general rise and fall in the

population over the years. Regardless of the current population their effects on the ecosystem are still evident.

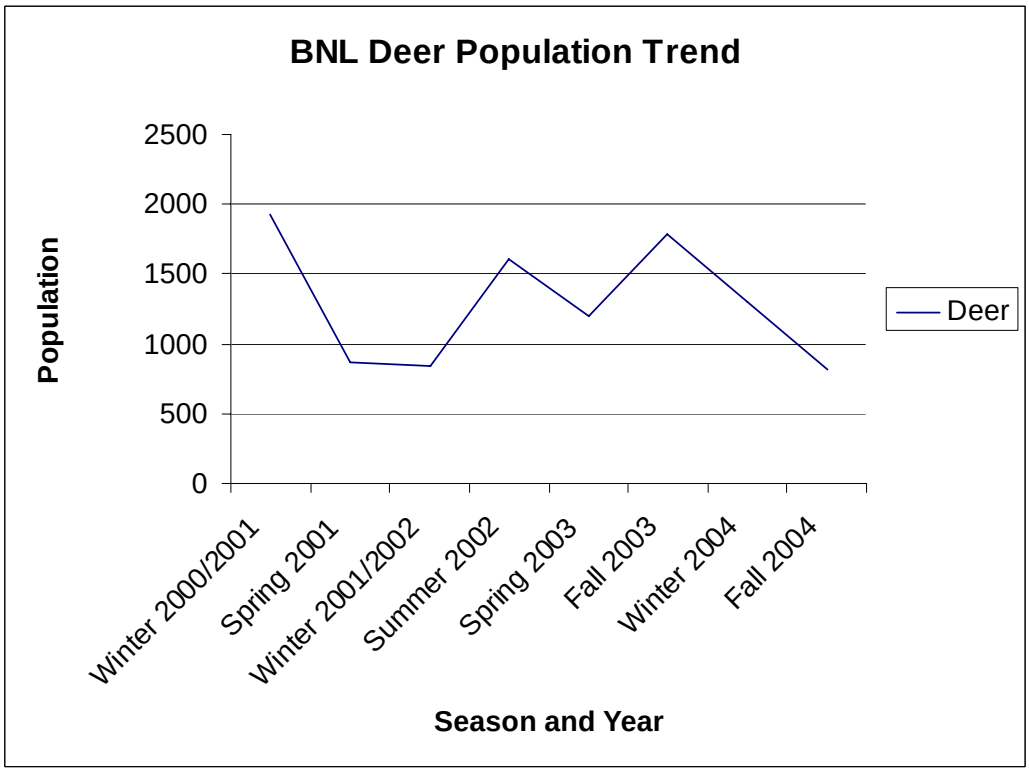

Figure 2. Trend in population estimates of white-tailed deer between 2001 and 2004 using old methodology of population estimation.

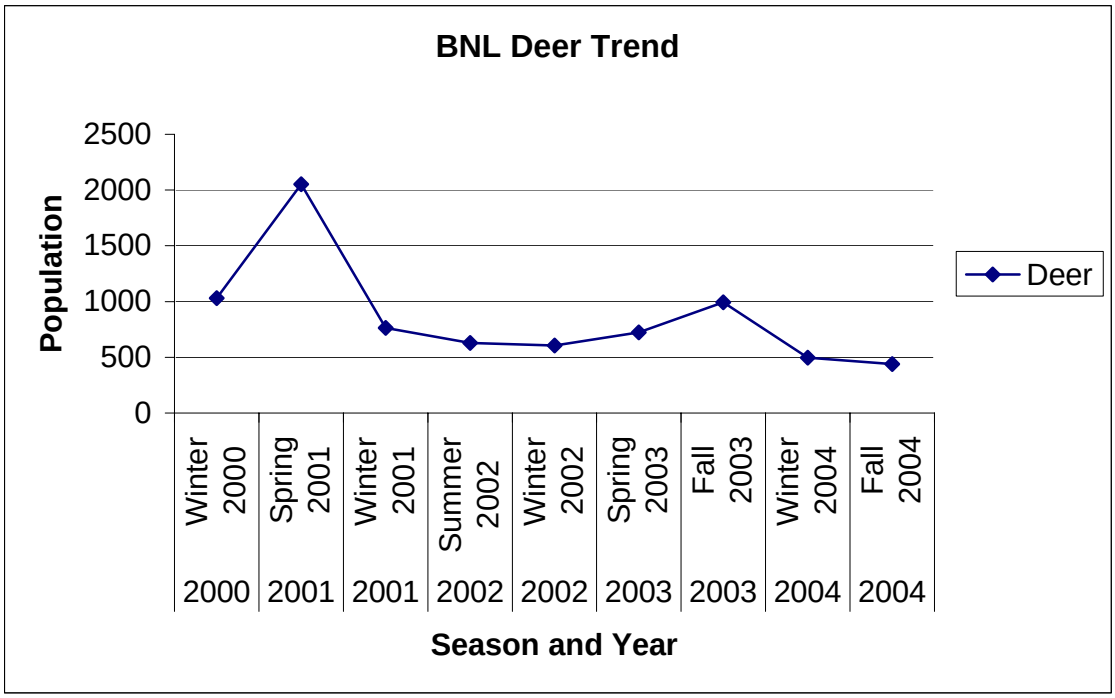

Figure 3. Trend in population estimates of white-tailed deer between 2001 and 2004 using new methodology. Note: Spring 2001 estimate is high due to limited data.

3.11 Special Status Species

BNL is home to a number of plants and animals that are considered special status species including the New York State endangered tiger salamander and Persius duskywing, and the state threatened banded sunfish, swamp darter, frosted elfin butterfly and northern harrier (Table 3). Endangered and threatened plants include the crested fringed orchid, stargrass, and stiff goldenrod. There is also a relatively long list of species of special concern, and rare or vulnerable plants. Under the NRMP the Lab is working to identify areas that may be suitable habitat for species on this list.

In addition to the list in Table 3, species like the wild turkey and Canada goose are also of interest due to their prominence and potential to interact with humans. Information on these species is maintained simply to be aware of potential issues that may arise.

3.11.1 Maintain Special Status Species List

Table 3 is the most recent update of the special status species list. The NYSDEC Natural Heritage program was contacted in October 2003 with a request to provide a list and locations of all natural heritage elements found on BNL. The response was sent on December 29, 2003. Based on the response, the list of special status species was updated. Additionally the worm snake (*Carphophis amoenus*) was added to the list after it was found on site during summer 2004 fieldwork. Table 3 contains all species identified onsite since the mid-1980s.

Two species last identified in 1919 and 1929 were left off the list but will be looked for and included if found. One the dwarf huckleberry (*Gaylussacia dumosa var. bigeloviana*) was identified southwest of the apartment complex in 1919. The second was the Virginia ground-cherry (*Physalis virginiana*) last seen in the area of the ballfields in 1929. Both areas have had other disturbances since their report dates and the two species may no longer occur on site.

Table 3. New York State Threatened, Endangered, and Species of Special Concern.

Common Name	Scientific Name	State Status
Insects		
Frosted elfin	*Callophrys iris*	T
Mottled duskywing	*Erynnis martialis*	SC
Persius duskywing	*Erynnis persius persius*	E
Fish		
Banded sunfish	*Enniacanthus obesus*	T
Swamp darter	*Etheostoma fusiforme*	T
Amphibians		
Eastern tiger salamander	*Ambystoma tigrinum tigrinum*	E
Marbled salamander	*Ambystoma opacum*	SC
Eastern spadefoot toad	*Scaphiopus holbrookii*	SC

Reptiles		
Spotted turtle	*Clemmys guttata*	SC
Eastern box turtle	*Terrapene carolina*	SC
Worm snake	*Carphophis amoenus*	SC
Eastern hognose snake	*Heterodon platyrhinos*	SC
Birds		
Horned lark	*Eremophila alpestris*	SC
Whip-poor-will	*Caprimulgus vociferus*	SC
Vesper sparrow	*Pooecetes gramineus*	SC
Grasshopper sparrow	*Ammodramus savannarum*	SC
Northern harrier	*Circus cyaneus*	T
Cooper's hawk	*Accipiter cooperii*	SC
Plants		
Stargrass	*Aletris farinosa*	T
Butterfly weed	*Asclepias tuberosa*	V
Spotted wintergreen	*Chimaphila maculata*	V
Flowering dogwood	*Cornus florida*	V
Pink lady's slipper	*Cypripedium acaule*	V
Winterberry	*Ilex verticillata*	V
Sheep laurel	*Kalmia angustifolia*	V
Narrow-leafed bush clover	*Lespedeza augustifolia*	R
Ground pine	*Lycopodium obscurum*	V
Bayberry	*Myrica pensylvanica*	V
Cinnamon fern	*Osmunda cinnamomera*	V
Clayton's fern	*Osmunda claytoniana*	V
Royal fern	*Osmunda regalis*	V
Crested fringed orchid	*Plantathera cristata*	E
Swamp azalea	*Rhododendron viscosum*	V
Long-beaked bald-rush	*Rhynchospora scirpoides*	R
Stiff goldenrod	*Solidago rigida*	T
New York fern	*Thelypteris novaboracensis*	V
Marsh fern	*Thelypteris palustris*	V
Virginia chain-fern	*Woodwardia virginica*	V

Notes:

* information based on 6 NYCRR Part 182, 6 NYCRR Part 193, and BNL survey data.

No federally listed threatened or endangered species are known to occur at BNL.

E = endangered, T = threatened, SC = species of special concern, R = rare, V = exploitably vulnerable

3.11.2 Identify Habitats of Special Status Species

When special status species are identified as being present on the BNL site, their habitats are also identified. If applicable, surveys for the correct habitat take place with surveys for the species in question occurring within the appropriate habitat and information concerning presence or absence of the species is recorded and maintained in BNL's GIS. Currently surveys for four species take place at least annually, they are the tiger salamander, banded sunfish, swamp darter, and frosted elfin.

3.11.3 Tiger Salamander

The eastern tiger salamander, a New York endangered species, is locally abundant on the BNL site. This species has been documented using at least 17 of the 27 ponds or pond systems on site. During the development of the NRMP pond designations were modified to lessen the confusion between confirmed (TS) and unconfirmed (ts) habitat.

3.11.3.1 Tiger Salamander Annual Egg Mass Surveys

Annual egg mass surveys were conducted between January and mid-April each year. During 2004 egg mass surveys, ponds TS-1, TS-2, TS-5, TS-7, TS-8, TS-A7 complex, TS-15 complex, TS-W6a complex, TS-W6b, and TS-A6 complex had egg masses documented. While historically more ponds have egg masses documented, weather conditions were instrumental in limiting access to many of the ponds during egg mass surveys. Ice remained on the ponds until late March to early April making access to the ponds difficult. Simply because egg masses were not found in a known pond does not imply that reproduction did not take place. This is evidenced by the presence of larval tiger salamanders in ponds where egg masses were not detected.

3.11.3.2 Tiger Salamander Larval Surveys

Larval surveys are conducted at ponds that have egg mass production during the spring breeding season. Of the ponds listed above larvae were identified at TS-A7, TS-7, TS-W6b and TS-9. In addition to these ponds larvae were also identified at TS-4 (formerly ts-A4, also known as Zeke's Pond), TS-6, and TS-10. The absence of larvae at a pond with egg masses does not preclude them from being there. Most ponds are difficult to enter and capture larvae due to debris (sticks and branches) on the pond bottom. Very few of the ponds on site dried down during 2004 and likely produced metamorphs.

Zeke's pond nearly dried up during the drought that occurred in 2002. This severe drying resulted in the removal of predatory fish. During reintroduction of banded sunfish in May 2003 several tiger salamander larvae were identified. Repeated trapping during summer 2003 resulted in five additional larvae. In discussions with NYSDEC, it was recommended that Zeke's pond be managed for threatened and endangered species and that banded sunfish, swamp darter, and tiger salamanders could likely co-exist. During the summer of 2004 walking, surveys of Zeke's pond documented the presence of tiger salamander larvae indicating that this pond serves both tiger salamanders and banded sunfish.

3.11.3.3 New Pond at RHIC

A new pond was constructed in the RHIC ring between August and December 2002. Under the wetlands permit for this pond the northern end is to be maintained as tiger salamander habitat. The pond edges were planted with native grasses during the summer of 2003 and wetland vegetation was supposed to be established in 2004. The pond dried down in late-summer leaving a very small pool on the northern end. This pool was enlarged and a shallow canal from the larger pond to the south was excavated to ensure a more permanent supply of water. Native vegetation is expected to emerge during the spring and summer months in 2005. Egg masses were identified in this pond, which is part of the TS-A6 complex. No larvae were documented during the summer months. The pond will continue to be surveyed for both egg masses and larvae.

3.11.3.4 Cover Board Surveys on one TS Pond

Coverboard surveys were discontinued in 2004, but several boards were left around both TS-7 and TS-10 to provide shelter for emerging metamorphs. Drift fence surveys of TS-6, TS-7, and TS-A7 either continued or were started in 2004.

3.11.3.5 TS-A7 Restoration of Meadow Marsh

The Environmental Restoration Program initiated the remedial action for the Meadow Marsh (TS-A7 ponds) in 2003. This action resulted in the construction of a single pond in the area of the two lined ponds of the Meadow Marsh project, and the removal of the shallow overland flow structures to the west of the two lined ponds. The new pond was designed to hold water for longer periods of time and at greater depths. The margins of the pond were planted with native sedges and emergent vegetation to serve as egg mass attachment points. The area surrounding the pond and the area to the west of the pond were planted with native grasses. Construction and revegetation of the area was completed in late October 2003. All work conducted to remove the old ponds and install the new pond was conducted under a wetlands equivalency permit issued by NYSDEC.

The reconstructed pond and area surrounding the pond was not expected to be heavily used during the first season after construction due to bare conditions prevent adult tiger salamanders from making it to the pond. However, egg masses were found in the pond during spring surveys, and metamorphic tiger salamanders emerged from the pond. Metamorphs from this pond emerged as late as mid-October nearly two months after emergence in other ponds. This late emergence is likely due to a lack of insect production in the pond because of it lacked sufficient organic nutrients to support a large insect population. As the pond matures, tiger salamander production and emergence should coincide with that of other ponds.

This pond is being monitored as part of a long-term study of tiger salamanders being conducted by the State University of New York at Binghamton to compare its use by tiger salamanders to typical use of coastal plain ponds by salamanders.

3.11.3.6 TS-W6b Pond Remediation ER Program

The TS-W6B Pond is located on the northwest edge of the Former Hazardous Waste Management Facility (FHWMF). The clean up of this facility under the Environmental Restoration Program is an ongoing project. The clean up and restoration of the wetland began during Fall 2004. Areas within the wetland with cesium-137 contaminant levels above 67 pCi/g were excavated. Much of the vegetation within the fenced area of the wetland was removed to allow access to the wetland in order to remove the contaminated sediment. The excavated material will be replaced to meet the original grade of the pond bottom, and the area will be planted with native vegetation. The Laboratory will institute control measures to protect the area in the future. All work on this wetland is scheduled for completion by mid-year 2005. All work for the restoration effort has been conducted under a wetlands equivalency permit issued by the NYSDEC.

3.11.4 Banded Sunfish

The banded sunfish (*Enneacanthus obesus*) is a New York threatened species that inhabits backwater areas of the Peconic River and Zeke's Pond. Substantial effort was expended from April through mid-November 2004 to capture as many banded sunfish as possible from the Peconic River ahead of and during the remediation effort. During the onsite portion of the remediation, a total of 147 banded sunfish were rescued and placed in Zeke's Pond until such time as the habitat in the Peconic River is suitable for returning the fish. A total of 46 additional banded sunfish were rescued from the offsite portion of the River. Walk through surveys of Zeke's Pond in July 2005 provided indication that the Banded Sunfish was breeding and surviving well in the pond.

3.11.4.1 Peconic River Flow Monitoring HMn

As mentioned above in section 3.7 Peconic River flows are recorded at numerous locations including at HMn. Flow is important for the survival of the banded sunfish in the Peconic River system.

3.11.4.2 OU V Peconic River Remediation Program

The Peconic River clean up began in April 2004 with the onsite portion of the river being cleaned during the spring and summer. As mentioned above, flows from the upstream portion of the river were diverted downstream past the east boundary of the Laboratory. This was done to facilitate the clean up. Short sections of the river were isolated using temporary dams and pumps to decrease the amount of water present in any given area being excavated. Besides capturing banded sunfish, staff and volunteers captured other fish, frogs, turtles, and snakes moving them either upstream or down stream out of the way of the project. All work on both the onsite and off site portions of the Peconic River Remediation Project is scheduled to be completed by mid-year 2005.

3.11.5 Frosted Elfin

The frosted elfin (*Callophrys iridis*) is a small orange-brown butterfly that is dependent on wild lupine. Historically, the frosted elfin was found along the south boundary and LIRR right of way at the south east corner of the Lab. This area is typified by soil disturbance that enhances habitat for wild lupine that in turn provides habitat for the butterfly.

3.11.5.1 Confirm Presence/Absence of Frosted Elfin

The NYSDEC and the NY Heritage program has sent a field biologist to Long Island each of the past two years. The historic area of occurrence has been surveyed each year. In 2002 the area had a healthy population of wild lupine but no evidence of the frosted elfin. In 2003 cooler temperatures in May and June resulted in poor production of flowers in the Lupine. Poor production of lupine persisted in 2004 and no evidence of the frosted elfin was seen.

3.11.5.2 Establish Monitoring Protocols for Frosted Elfin

BNL has participated with the NYSDEC and NY Heritage during their surveys, but should develop monitoring protocols for onsite use. A better understanding of the life history of this butterfly is needed in order to establish effective protocols.

3.11.5.3 Maintain and Enhance Habitat for Frosted Elfin

Wild lupine likes disturbed soil areas as is found along the south firebreak at the southeast corner of the Lab. This area was partially scraped during the first few months of 2003 as part of security enhancements along the BNL property line. The effects of scraping will likely benefit the wild lupine in the area. In addition 5 pounds of lupine seed was purchased as part of the revegetation efforts of BNL. Some of the seed was spread along the disturbed areas of the RHIC ring and seeds were spread along bare areas of the east firebreak in an effort to establish broader habitat for the frosted elfin.

Cool temperatures during spring 2004 seem to have limited the growth of the planted lupine as well as native populations. The areas where lupine was planted will continue to be observed and the original area of lupine will be disturbed in the spring of 2005 prior to growth of the plants.

3.11.5.4 Habitat assessment for Lupine

Areas that were planted with wild lupine in Spring 2003 were evaluated in 2004. New plants that were noticed in several areas of the RHIC ring in 2003 appeared to be absent in 2004. No new plants were seen along the east firebreak in 2004. Deer are known to browse on lupine and may have been responsible for the loss of newly established plants.

3.12 Habitat Enhancement other species

Several species of birds have been targeted for improvements in nesting habitat. These include the eastern blue bird, kestrel, and wood duck. As information is gained on other species of special interest, habitat improvement needs will be identified and implemented as necessary.

3.12.1 Bird nests/boxes

Nest boxes are important for many species of birds because of the lack of proper habitat. This is particularly true of birds that utilize cavities for nesting. The eastern bluebird is one of the better know birds for which nest boxes are important. BNL currently has 46 boxes distributed across the site in appropriate habitat (open fields near forested areas). Each year over the past three years at least 19 of the 48 boxes have been used by the eastern bluebird. This amount of usage is above average compared to other areas on Long Island that are being monitored. Due to the success of nest box programs for the eastern bluebird across the state it has been taken off of the NY State list of special concern species. House wrens, tree swallows, chickadees, and tufted titmouse also use the bluebird boxes (Table 4).

Through Eagle Scout projects nest boxes for kestrels and wood ducks have been constructed. Ten kestrel boxes were installed along the east firebreak in 2002, but were positioned too close together. A second project moved the kestrel boxes to a more appropriate spacing along the firebreak. In addition wood duck boxes were constructed late in 2003 for installation during Spring 2004. The wood duck boxes were successfully placed in March 2004 and inspection of the boxes in October indicated limited use. Both the wood duck and kestrel boxes are now on an annual schedule and are visited by volunteers to prepare the boxes for use in the spring and clean them in the fall. A volunteer continues to monitor the bluebird boxes several times each year.

Table 4 Results of Bluebird Nest Box Monitoring 2001 - 2004

Summary of Nesting Success							
Year	# of Boxes	Empty/other	Bluebird	House Wren	Tree Swallow	Chickadee	Tufted Titmouse
2001	37	17	19	6	1		
2002	46	19	19	6	6	2	
2003	46	27	21	2	4		2
2004	48	12	22	6	6		

3.12.2 Surveys and Monitoring

Conducting surveys and routine monitoring allows BNL to identify, track, and trend population status for a number of species. New surveys for reptiles and amphibians, Odonata (damselflies and dragonflies), and incidental reporting of other species during routine activities results in a better understanding of which species are present. The following discussions will touch on the results of various surveys and monitoring in 2004.

3.12.3 Develop Survey Methodology to document all Biota on BNL

A full set of monitoring and survey protocols are still needed. During meetings of the TAG during Fall 2003, discussions centered on the need for a database of all ecological research available on the Pine Barrens and the development of monitoring protocols for the Pine Barrens. Monitoring protocols developed for the Pine Barrens would be applicable to the Natural Resource Management program at BNL. Toward the end of 2003 a request for proposals for the research database and monitoring protocols was sent to potential contractors and two contracts were established in 2004. The two contracts were to develop a searchable database of all known reports and scientific information related to the Central Pine Barrens and to develop a set of monitoring protocols to collect information concerning forest health in the Pine Barrens. Both contracts are scheduled for completion in the first half of CY 2005.

3.12.3.1 Reptiles and Amphibians

Beginning in January 2003 U.S. Fish & Wildlife personnel managing the Upton Reserve began random surveys of the BNL site with a goal to identify all species of reptiles and amphibians (herpetiles) expected on site. The result of these extensive surveys has increased the total number of herpetiles from 25 to 29 (Table 5). The eastern worm snake (*Carphophis amoenus amoenus*) was added to the verified list during summer 2004, leaving only the smooth green snake (*Opheodrys vernalis*) to be verified as present/absent onsite.

Table 5. Amphibians and Reptiles documented at BNL.

Amphibians and Reptiles of BNL			
Amphibians	*Scientific Name*	Reptiles	*Scientific Name*
Frogs/Toads		Turtles	
Spring peeper	*Hyla crucifer*	Eastern box turtle	*Terrapene carolina carolina*
Northern gray treefrog	*Hyla versicolor*	Snapping turtle	*Chelydra serpentina*
Bull frog	*Rana catesbeiana*	Northern painted turtle	*Chrysemys picta picta*
Green frog	*Rana clamitans*	Spotted turtle	*Clemmys guttata*
Pickerel frog	*Rana palustris*	Musk turtle	*Sternotherus odoratus*
Wood frog	*Rana sylvatica*	Snakes	
Fowler's toad	*Bufo woodhousei fowleri*	Eastern ribbon snake	*Thamnophis sauritus sauritus*
Eastern spadefoot toad	*Scaphiophus holbrooki*	Eastern hognose snake	*Heterodon platyrhinos*
Salamanders		Northern ring-necked snake	*Diadophis punctatus edwardsi*
Four-toed salamander	*Hemidactylium scutatum*	Brown snake	*Storeria dekayi dekayi*
Redbacked salamander	*Plethodon cinereus*	Northern black racer	*Coluber constrictor constrictor*
Red-spotted newt	*Notophthalmus viridescens*	Northern water snake	*Nerodia sipedon sipedon*
Marbled salamander	*Ambystom opacum*	Eastern garter snake	*Thamnophis sirtalis sirtalis*
Eastern tiger salamander	*Ambystoma tigrinum tigrinum*	Northern red-bellied snake	*Storeria occipitomaculata*
Spotted salamander	*Ambystoma maculatum*	Eastern milk snake	*Lampropeltis triangulum triangulum*
		Eastern worm snake	*Carphophis amoenus*

Other interesting work on reptiles and amphibians included radio telemetry tracking of eastern hognose snakes (*Heterodon platyrhinos*) and initiation of radio telemetry work with spotted turtles (*Clemmys guttata*).

Beginning in May 2003 the FWS began work on tracking the eastern hognose snake on site. The project emerged from the identification of a local population of this once plentiful snake. In 2002 five different sightings of this snake indicated that there was at least a small population still in existence on Long Island. A researcher from Hofstra University that had attempted to find the snake two years previous provided implantable radio transmitters for use by the FWS and BNL. With assistance from Lab employees, five snakes were captured and implanted with the transmitters. The transmitters were implanted by a veterinarian from the Wildlife Conservation Society (Bronx Zoo). The snakes were released at the point of capture, then tracked on a daily basis for several weeks, then weekly until they went into hibernation. The project was continued in 2004 with eight new transmitters purchased. Two surviving snakes from 2003 were recaptured and new transmitters implanted. Six additional snakes were captured and implanted. Of the eight snakes implanted, one either lost its transmitter, or was preyed upon. The transmitter was found without any evidence of the snake. The transmitter was sterilized and implanted into a ninth snake. All snakes were tracked through the summer with exception of the snake mentioned above and two additional snakes that either died or expelled their transmitters. A fourth snake was found dead resulting from road mortality on the east firebreak and two others died as a result of mammalian predation. This left only three snakes alive at the time of hibernation. This project will continue in 2005 when the three remaining snakes are recaptured and new transmitters implanted.

When snakes are found, their location and identification are recorded and added to a database. Larger snakes like eastern hognose and black racers are injected with a Passively Induced Transponder (PIT) tag. PITs provide a unique identifier and will allow long-term tracking of individuals. Using a specialized tag reader to access the identification number held in the PIT circuitry identifies an individual snake with a PIT. When a PIT carrying snake is identified the information on capture location is recorded. Repeated captures will allow analysis of age and movement over long periods of time.

In October 2003 the Cold Spring Fish Hatchery and Museum provided sixteen spotted turtles for release on site. Six of the largest turtles were outfitted with transmitters. All sixteen turtles were shell notched and released. The six turtles with transmitters were followed every few days until they went into hibernation. A weekly radio fix was obtained to determine if there was any movement during the winter. Once the turtles emerged from hibernation in 2004 they were tracked weekly until June when they were tracked daily through the summer months. Their movements were recorded in BNL's GIS. Some individuals moved as much as ¾ of a mile at a time and utilized overland movements instead of movements through aquatic habitats. This project will continue through the summer of 2005 in order to gain a better understanding of the habitat needs of this species.

Interns began marking all eastern box turtles found by notching their carapace and releasing them. The practice started in 2003 and continued in 2004. A database of marked turtles was started. In the future if a turtle is captured it will be inspected for

shell notches. If a notch pattern is identified, the turtle's location will be documented in a database. If there is no pattern, the shell will be notched and an initial entry will be made in the database for future tracking. Assistance from Lab employees must be developed to further the success of this program. A total of 114 turtles have been captured since 2003 of which 100 have been marked and 6 have been recaptured. As a result of this program at least 6 turtles were captured with ear infections and brought to the Bronx Zoo or a wildlife rehabilitator for treatment. The presence of turtles with this type of infection is of concern as there is potential for the illness to spread through the population. Infected turtles that are successfully treated are returned to the location where they were found.

3.12.3.2 Monitor Canada Goose & Wild Turkey Populations

The Canada goose population on site is currently estimated to be between 80 and 120 birds. A standardize protocol must still be developed to make a more accurate estimate. In June 2003 the NYSDEC requested permission to band Canada geese on site. Twenty-one geese were banded. A second attempt to band additional geese was made but was unsuccessful. Banding allows researchers and waterfowl biologists opportunities for information gathering. During future efforts, banded geese will be recorded which allows estimates of age to be made. If a goose is shot by hunters or found dead the information from the band is sent to the FWS where information on banded birds is maintained. Through nationwide efforts the banding information leads to a better understanding of the larger population of geese in the Northeast.

3.12.3.3 Turkey Sighting Reports to NYSDEC

The NYSDEC gathers information on wild turkeys during August each year. In 2003, BNL began sending NYSDEC reporting cards for turkey observations at BNL. This is different from past practices where verbal or e-mail reports of population status were utilized. The new reporting method is followed up with verbal and written communications. A standardized mechanism for estimating the turkey population needs to be developed. The current population estimate of wild turkey went from approximately 175 birds in January and February 2003 to well over 300 birds by September 2003. The population increased again due to successful breeding in 2004. The estimated population is now between 400 and 500 birds.

The BNL turkey population is sufficiently large that NYSDEC requested permission to trap birds on site for transfer to the Easthampton area on eastern Long Island. In March 2004, twenty-nine birds were trapped and transferred to a release site in Easthampton. Because the wild turkey population is thriving throughout eastern Long Island the need for trap and transfer programs has diminished and will likely not take place in 2005.

As the population continues to grow, there is potential for nuisance situations to arise. BNL will work with NYSDEC, as necessary, to address problems resulting from a large turkey population.

3.12.3.4 Song Bird Surveys

Songbird surveys have been carried out since May 2000. Initially, five survey routes were established that went through varying habitats on site. A sixth route (Z-Path) along the eastern boundary of the Lab was added in 2002. Monitoring involves acquisition of ambient weather information at the beginning and end of each route, and counting the number of individuals of each species heard or seen during a five minute period at each point on the route. Points are spaced approximately 300 meters (Fig. 3) apart to prevent overlap of counts from point to point. During the first three years monitoring occurred from March through October each year. After review of the first three year's worth of data, the March and October surveys resulted in detection of birds that primarily over winter. Therefore, beginning in 2003 monitoring was shortened to occur only from April through September of each year to monitor breeding birds.

Songbird monitoring, over extended periods, can provide some indication of ecosystem health. Breeding songbirds rely on suitable habitat for nesting and foraging. Declining populations of songbirds may indicate declining forest health. Care must be used when interpreting information as the majority of songbirds are migratory and populations may be affected by conditions in their winter habitat. If declines are seen, then research on wintering habitat conditions must be made to determine which area is having an affect on the population.

The current results of monitoring are provided in Table 6 below. Over the past four years the average number of birds detected on all survey routes is 73 species. In 2004, 68 species of birds were detected. Routes next to wetlands (Peconic River and Biology Field routes) continue to have the highest number of species detected. This is likely due to higher biodiversity in these habitats that support a greater variety of nesting sites and foraging opportunities. Results along the Z-Path route are also beginning to indicate high number of species, likely due to the variability of habitats along this route. The Z-Path route goes through the most diverse habitats, ranging from pine forest, to wetlands, to mixed forest.

Over all, songbird surveys have resulted in the detection of 109 species of birds over the past five years. Most species detected have been breeding songbirds. However several species like herring gulls, double crested cormorants, and other sea birds were detected as they flew over the site.

As data is collected comparisons need to be made with breeding bird surveys (BBS) that have been occurring each year since 1966. Data on these surveys is available from the Patuxent River Research Center in Maryland. Long-term surveys like the BBS have indicated a decline in most songbird species. The intent of comparing BNL data to BBS data would be to document health of the local bird populations. The five-year trend in BNL data for each transect is presented in Figure 4. The overall trend shows declining numbers of species seen. However, when looking at data for the 55 most common birds detected (Table 7) there is variability by species. One species may be declining while another is increasing in numbers. It is important to utilize both a global perspective using all species as well as look at individual species and use a long-term analysis comparing to

historic data rather than rely on a limited set of data. BNL will continue monitoring in 2005.

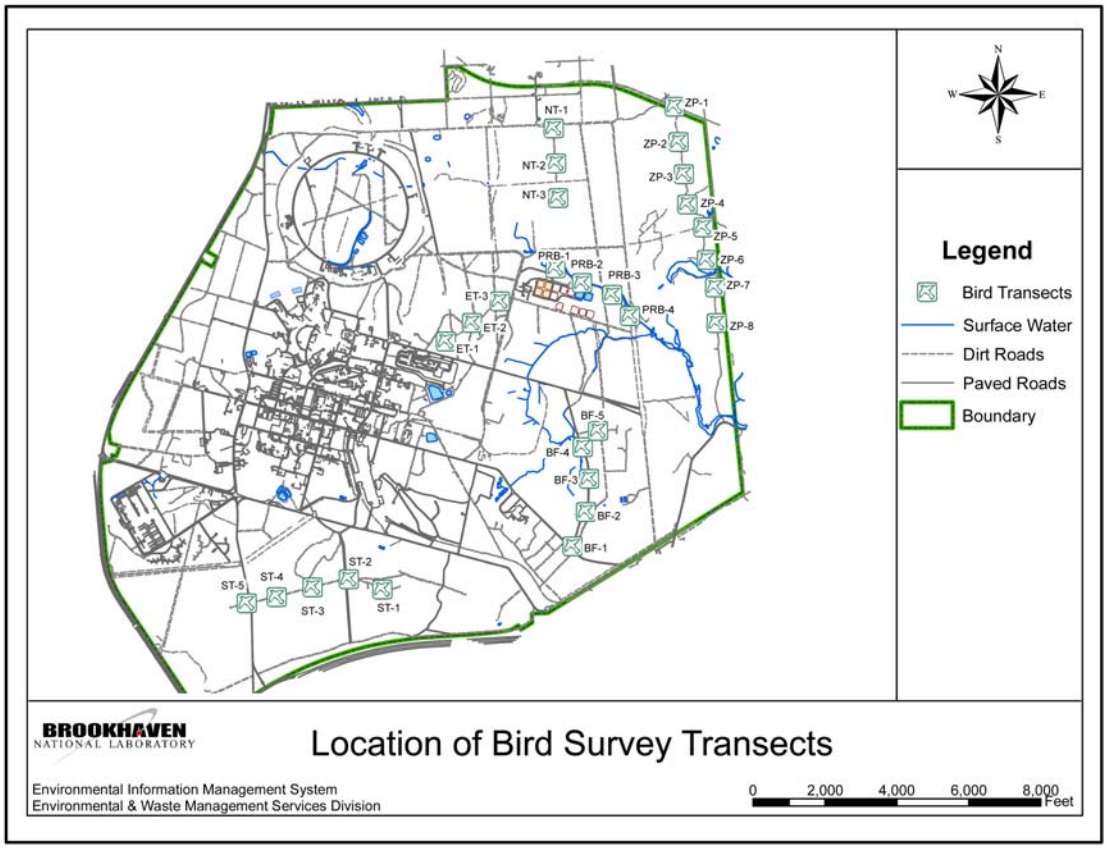

Figure 3. Songbird survey routes.

Table 6. Results of Bird Surveys

Bird Survey Results 2000 - 2004									
Year	# of Species Identified	# New Species Identified	Total # of Species	# of Species Biology Fields	# of Species East Trenches	# of Species North Transect	# of Species Peconic River	# of Species South Transect	# of Species Z-Path
2000	73		73	50	31	23	48	32	
2001	73	20	93	53	32	34	45	39	
2002	73	7	100	45	29	30	43	29	47
2003	79	6	106	49	27	31	47	33	44
2004	68	2	108	45	24	33	44	28	41

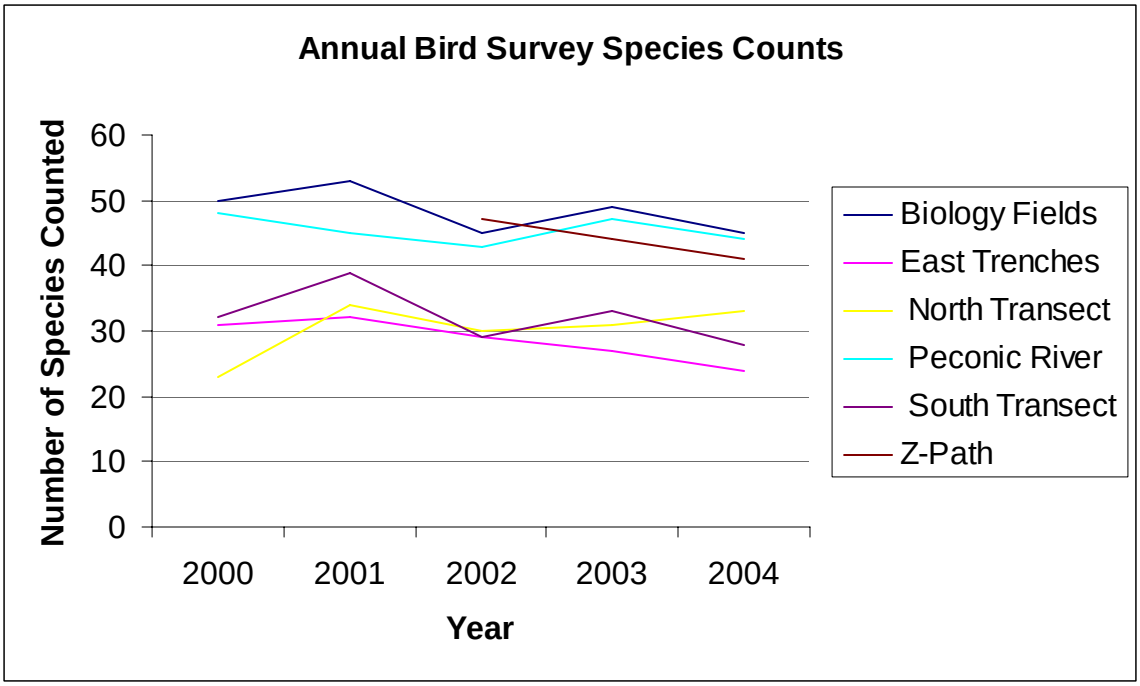

Figure 4. Trends in species counts of songbirds per transect from 2000 – 2004.

Table 7. Data concerning routinely documented bird species

		Year - Number				
Common Name	Scientific Name	2000	2001	2002	2003	2004
American Crow	*Corvus brachyrhynchos*	71	74	87	121	49
American Robin	*Turdus migratorius*	207	120	492	231	176
Baltimore Oriole	*Icterus galbula*	6	41	39	53	53
Barn Swallow	*Hirundo rustica*		2	2	5	1
Black-and-White Warbler	*Mniotilta varia*	11	10	11	12	1
Black-billed Cuckoo	*Coccyzus erythropthalmus*	10	14	9	3	
Black-capped Chickadee	*Poecile atricapillus*	84	114	122	111	173
Blue Jay	*Cyannocitta cristata*	123	216	319	288	253
Blue-Grey Gnatcatcher	*Polioptila caerulea*		5	6	3	3
Blue-winged Warbler	*Vermivora pinus*	1		3	3	1
Brown Thrasher	*Toxostoma rufum*	9	6	1	7	1
Brown-headed Cowbird	*Molothrus ater*	9	34	98	81	84
Canada Goose	*Branta canadensis*	28	82	46	216	103
Carolina Wren	*Thryothorus ludovicianus*	1	1	7	1	9
Cedar Waxwing	*Bombycilla cedrorum*	39	2	22	2	1
Chipping Sparrow	*Spizella passerina*	124	130	195	182	237
Common Grackle	*Quiscalus quiscula*	40	55	64	90	153
Common Yellowthroat	*Geothlypis trichas*	11	10	20	15	11
Cooper's Hawk	*Accipiter cooperii*		1	4	2	1
Downy Woodpecker	*Picoides pubescens*	7	17	30	24	35
Eastern Bluebird	*Sialia sialis*	1	2	7	3	3
Eastern Kingbird	*Tyranus tyranus*	2	1	4	8	3
Eastern Phoebe	*Sayornis phoebe*	3	10	9	2	10

Eastern Towhee	*Pipilo erythrophthalmus*	151	216	252	211	219
Eastern Wood Peewee	*Contopus virens*	68	51	67	59	70
European Starlings	*Sturnus vulgaris*	32	21		18	7
Fish Crow	*Corvus ossifragus*		3	1	2	2
Goldfinch	*Carduelis tristis*	54	35	49	70	82
Grey Catbird	*Dumetella carolinensis*	57	65	68	62	49
Hairy Woodpecker	*Picoides villosus*		3	3	2	2
Hermit Thrush	*Catharus guttatus*		5	4	1	4
House Wren	*Troglodytes aedon*	14	4	7	11	3
Indigo Bunting	*Passerina cyanea*		5	11	15	21
Mallard Duck	*Anas platyrhyncos*	2	7	3	2	1
Mourning Dove	*Zenaida macroura*	55	41	78	39	46
Northern Cardinal	*Cardinalis cardinalis*	15	13	7	16	8
Northern Flicker	*Colaptes auratus*	31	21	38	20	27
Northern Mockingbird	*Mimus polyglottos*	6	13	13	9	6
Ovenbird	*Seiurus aurocapillus*	19	71	86	58	65
Pine Warbler	*Dendroica pinus*	5	23	54	25	81
Red-bellied Woodpecker	*Melanerpes carolinus*	12	8	4	7	15
Red-breasted Nuthatch	*Sitta canadensis*	5	19	13	11	25
Red-eyed Vireo	*Vireo olivaceus*	24	31	15	20	28
Red-tailed Hawk	*Buteo jamaicensis*	3	2	2	6	6
Red-winged Blackbird	*Agelaius phoeniceus*	8	12	45	16	34
Scarlet Tanager	*Piranga olivacea*	3	8	7	15	11
Sharp-shinned Hawk	*Accipiter striatus*	1		1	1	2
Tree Swallow	*Tachycineta bicolor*	6	3	8	9	17
Tufted Titmouse	*Baeolophus bicolor*	34	19	29	32	25
Veery	*Catharus fuscescens*	3	1	6	3	3
White-breasted Nuthatch	*Sitta carolinensis*	5	3	3	3	3
Wild Turkey	*Meleagris gallopavo*	15	3	7	8	9
Wood Thrush	*Hylocichla mustelina*	43	16	10	10	12
Yellow Warbler	*Dendroica petechia*	1		1	1	1
Yellow-billed Cuckoo	*Coccyzus americanus*	13	8	20	26	5

3.12.3.5 Odonate Surveys

Surveys of Odonata (dragonflies and damselflies) were started in June 2003. Two undergraduate interns working through the Education Programs Office carried out this work in 2003 and one intern returned in 2004 to continue the effort. A total of 28 species of dragonflies (6 new species for 2004) and 18 species of damselflies (8 new species for 2004) were identified from seventeen locations on site. Where possible both larval and adult forms were identified. The project was to initially look at only three ponds, but was expanded as the interns became more proficient at capture and identification. The project is to be continued in 2005 with an expansion to other ponds and locations at BNL. Table 8 presents compiled data with indications of the number of ponds each species was found at. Several species are ubiquitous, being found at most ponds, while some species are highly specific in their habitat needs.

Odonata being aquatic predatory insects and relatively easy to capture and identify, may be useful indicators of wetland health. Damselflies are highly specific egg layers, only laying eggs on or in the tissues of certain plants. In general the more diverse the damselfly population is, the higher the diversity of aquatic plants in a specific wetland. With appropriate training and familiarity with dragonflies and damselflies, a relatively quick assessment of a wetland's health may be made. For example the absence of a species with particular needs at a specific pond may provide indication that significant change is occurring at that location.

Table 8. Dragonfly and damselfly species identified during surveys at BNL.

Species Distribution Table		
Dragonflies		
Family Aeshnidae	**Scientific Name**	**Number of Ponds**
Comet Darner	*Anax lonipes*	3
Common Green Darner	*Anax junius*	17
Shadow Darner	*Aeshna umbrosa*	2
Swamp Darner	*Epiaeschna heros*	4
Family Corduliidae		
Williamson's Emerald	*Somatochlora williamsoni*	1
Family Gomphidae		
Ashy Clubtail	*Gomphus lividus*	1
Unicorn Clubtail	*Arigomphus villosipes*	2
Family Libellulidae		
Band-winged Meadowhawk	*Sympetrum semicinctum*	4
Bar-winged Skimmer	*Libellula axilena*	3
Black Saddlebags	*Tramea lacerata*	14
Blue Corporal	*Libellula deplanta*	2
Blue Dasher	*Pachydiplax longipennis*	17
Calico Pennant	*Celithemis elisa*	1
Carolina Saddlebags	*Tramea carolina*	11
Cherry-Faced Meadowhawk	*Sympetrum internum*	11
Common Whitetail	*Libellula lydia*	15
Eastern Amberwing	*Perithemis tenera*	2
Eastern Pondhawk	*Erythemis symplicicollis*	6
Great Blue Skimmer	*Libellula vibrans*	6
Halloween Pennent	*Celithemis eponina*	1
Painted Skimmer	*Libellula semifasciata*	7
Setwing	*Dythemis*	1
Slaty Skimmer	*Libellula incesta*	7
Spot-winged Glider	*Pantala hymenaea*	1
Twelve-Spotted Skimmer	*Libellula pulchella*	15
Wandering Glider	*Pantala flavescens*	3
White-faced Meadowhawk	*Sympetrum obtrusum*	4
Widow Skimmer	*Libellula luctuosa*	2
Damselflies		
Family Calopterygidae		
Ebony Jewelwing	*Calopteryx maculata*	1
Family Coenagrionidae		
Azure Bluet	*Enallagma aspersum*	11
Big Bluet	*Enallagma durum*	1
Citrine Forktail	*Ischnura hastata*	6
Eastern Forktail	*Ischnura verticalis*	8

Familiar Bluet	*Enallagma civile*	4
Fragile Forktail	*Ischnura posita*	3
Marsh Bluet	*Enallagma ebrium*	1
Northern Bluet	*Enallagma cyathigerum*	2
Rambur's Forktail	*Ischnura ramburii*	3
Skimming Bluet	*Enallagma geminatum*	1
Variable Dancer	*Argia fumipennis violacea*	1
Family Lestidae		
Amber-winged Spreadwing	*Lestes eurinus*	3
Common Spreadwing	*Lestes disjunctus disjunctus*	1
Elegant Spreadwing	*Lestes inaequalis*	1
Slender Spreadwing	*Lestes rectangularis*	5
Sweetflag Spreadwing	*Lestes forcipatus*	5
Lyre-tipped Spreadwing	*Lestes unguiculatus*	5
Shading indicates a species found in 2004		

3.12.4 Population Management

There are currently four species on site whose populations either do or may require management in the near future. These are the white-tailed deer (discussed above), Canada geese, wild turkey, and feral cats.

3.12.4.1 Manage Canada Goose Population

As mentioned above, the Canada goose population is currently estimated at between 80 and 120 birds living year round on the BNL site. Should the nuisance situations caused by resident Canada geese increase to an unacceptable level, the appropriate permits to allow population reductions will be obtained from NYSDEC and FWS would be obtained. In addition appropriate public dialog would also take place prior to any actions. As stated above, better monitoring to give a better population estimate must be developed. In 2004, an additional 21 geese were banded bringing the total banded at BNL to 49. One goose banded in 2003 was hit by a car and died. Additionally two geese banded elsewhere were captured in 2004 as were 4 geese that were banded in 2003. Occasionally nesting geese and geese with goslings cause concern for BNL employees because of their nesting behavior. A nesting pair of geese routinely causes problems at NSLS. In general workers at NSLS try to avoid the area near the nesting pair in order to not be attacked.

3.12.4.2 Manage Wild Turkey Population

As the wild turkey population continues to grow, the likelihood of nuisance situations and over population may come about. The NYSDEC currently does not allow hunting of wild turkey on Long Island. Should the population reach levels requiring control, special permits and arrangements would need to be made with NYSDEC. As with any population management, appropriate public dialog would occur prior to actions. The first complaints concerning wild turkey came in 2004. 2 to 4 turkeys routinely caused problems at the firehouse early in 2004. Arrangements were made to move the birds but removing them to another portion of the Lab was not necessary. Should complaints

result in the future BNL will work in cooperation with NYSDEC to remove and transfer problem birds to other areas onsite.

3.12.4.3 Feral Animals

Feral animals are considered to be domestic animals that have been released to the wild and have lost their basic domestication. Examples of typical feral animals are wild and free roaming dogs and cats. Currently, there is no indication of wild and free roaming dogs at BNL. However, there is an estimated 30 – 50 feral cats of which approximately 35 are managed in three cat colonies by an ad hoc group of Laboratory employees, who are working to humanely reduce the population onsite.

In 2004, a photographic survey of the cats being maintained in the colonies was initiated. Based on photographic comparisons the current population of cats is estimated at 40 in the colonies with a few other cats scattered throughout the Laboratory.

3.12.4.3.1 Establish BNL Policy on feral animals

Because feral and free ranging animals disturb native animals primarily through predation, the Laboratory needs a Policy on maintaining pets on site. Long-term and sometimes short-term residents using the onsite apartments may have pets. On occasion it is likely that some of these pets were simply abandoned when the residents left the Laboratory. In order to prevent such actions, a policy on having pets, outlining the appropriate care and disposition of these animals needs to be adopted. The Quality of Life Office has developed some basic permission forms for pets. Both the Lab and the individual entering an apartment agreement must sign these forms.

3.12.4.3.2 Protocols for monitoring and managing feral cats

A concern of the Natural Resource Management program with regard to the feral cat colonies on site is whether or not they are actually being reduced in size over time. Research in other parts of the country indicates that managed colonies may have significant impact on local wildlife populations and the simple act of managing the colony does not reduce the population. Therefore, a monitoring protocol is currently being developed to identify individual cats in each colony in order to track the population.

Beginning in November 2003 the three cat colonies have been surveyed to estimate the actual population. Digital photographs of cats have been taken and markings that will facilitate the identification of individuals are being sought. By the end of 2003 more than 20 cats have been identified based on unique coloration and markings. Several cats appear to be so closely related that individuals cannot be distinguished. Additional monitoring methods will continue to be investigated to overcome this problem. By mid-April 2004 the majority of the known cats had been photographed. The process of photographing the cats will be repeated annually to determine whether the population is declining.

3.13 Vegetation Management

The NRMP provides for managing vegetation at BNL. Three key aspects of vegetation management are addressed: the vegetation within the local ecosystem, use of native vegetation in landscaping and restoration activities, and management of invasive plant species. BNL joined the EPA Region 2 Performance Track program with one of the commitments being the restoration of 10 acres/year to either native vegetation or to a prescribed fire regime.

3.13.1 Native Vegetation

Native vegetation is considered to be plant species (trees, shrubs, grasses, etc.) that are from the Long Island area and not introduced species. Management of native vegetation involves both forest management of the Pine Barrens and management of landscaping, which is carried out primarily by Plant Engineering Grounds Maintenance crews. In partial fulfillment of BNL's goal of 10 acres of vegetation restored, approximately 9 acres of mowed areas were designated "no-mow" areas to encourage reversion back to forest.

3.13.1.1 Establish Protocol for Use of Native Vegetation

Over the past several years BNL has been using native vegetation for various projects. The most work has been carried out at the RHIC ring with lesser amount of work being conducted between restoration work and planting areas left bare after demolition of obsolete buildings. While the NRMP stresses use of native vegetation there is no procedure built into design work requiring use of native vegetation. Development of a protocol must still be developed. Most development projects now utilize the Natural Resource Manager as a reviewer to ensure use of native plants where applicable. BNL's Master Planning document for infrastructure changes now includes a list of acceptable native plants for trees, shrubs, and ornamentals. Lawn areas are still typically planted with non-native grasses as no suitable native "turf" grass has been identified.

3.13.1.2 Use Native Vegetation on Restoration and new Construction Projects

In 2004 native grasses, shrubs, and trees were used for restoration work completed under the Environmental Restoration program, and on construction projects carried out by Plant Engineering. Restoration program projects included the Meadow Marsh project and the Peconic River remediation. Construction projects utilizing native vegetation included the former warehouse areas, which had native trees planted and will have native grasses planted in the spring of 2005. In addition planning for the construction of the Functional Center for Nanomaterials included use of native plants in the landscape design.

3.13.1.3 RHIC Revegetation

The RHIC Revegetation project was in its 3rd year during 2004. Pitch pine seedlings planted between 6 O'clock and 8 O'clock positions in 2002 continued to show good growth. Grasses planted in all remaining bare areas except between 2 and 4 O'clock were becoming better established. The area between 2 and 4 O'clock continues to not

allow grasses to establish. Few grasses or wildflowers that had been planted will germinate. The area has a layer of lichens and mosses in many spots that seem to eliminate grass seed germination. One last attempt at planting the area will occur in 2005. Should the grasses not take, the pitch pines in the area are beginning to grow and will eventually cover the area. The restoration will take longer but will be more natural than planting seed.

3.13.1.4 Establish Policy and procedure for cutting trees

A policy and procedure for tree cutting still needs to be developed.

Over the past several years issues related to forest clearing, tree maintenance, and tree cutting have raised concern over how decisions for these actions are made. Currently an informal process is used in which the Assistant Laboratory Director for Facilities and Operations makes a decision based on input from Plant Engineering and the Natural Resource Manager. This process should be formalized with the potential for decisions being made below the Assistant Laboratory Director level. No further work has taken place on this action in 2004, as it is a lower priority issue.

3.13.2 Invasive Species

Invasive plants and animals have the potential to severely disrupt native ecosystem functions. In order to understand invasive species and manage them on Long Island a number of agencies and landowners joined together in 2002 to create the Long Island Weed Management Area (LIWMA). The group is lead and coordinated by The Long Island Chapter of The Nature Conservancy. BNL is a participant in this project supporting efforts through implementation of programs at the Lab.

3.13.2.1 Identify and Monitor Distribution of Invasive Species

An invasive species-mapping project was started in 2003. A summer intern began mapping all invasive plants found at BNL. This project mapped a little over 50% of the land area on site (Figure 4). Most of the invasive species found were located along roads, firebreaks, and trails. This distribution is indicative of transport of species by anthropogenic forces (seeds on vehicles, bicycles, shoes, etc.) The map that was developed is now included in the GIS as a layer for use in planning control and tracking progress of invasive species management. The map was updated in 2004 based on limited new information from the "Weed Watchers" group and staff working in the field. Periodic updates to the map will be made in the future. A summer intern is planned for 2005 and will work on the distribution of invasive plants within the pocket forests of the developed portions of the Lab.

3.13.2.2 Establish Volunteer "Weed Watchers" group

A volunteer group called the BNL Weed Watchers was established in April 2003. This group is an offshoot of the LIWMA Weed Watchers group that identifies invasive species across Long Island. Since BNL has limited access, there was a need for a BNL based group. The BNL Weed Watchers will continue mapping invasive species on site and will

eventually assist in some of the control efforts. A web site has been developed to facilitate the mapping and reporting of invasive species at BNL. The page is accessible at http://www.bnl.gov/esd/wildlife/weed_watchers.htm. Activities of the BNL Weed Watchers is managed by a volunteer coordinator who works to get the group appropriate training, assists with reporting, and brings in speakers to keep the group up to date with activities of the LIWMA Weed Watchers.

3.13.2.3 Removal or Control of Invasive Plants

This action must still be planned. Some control and removal of invasive plants was needed in 2004, but funding and priorities were not sufficient to get the plants removed. Several areas containing small infestations of highly invasive plants were identified in 2003. The plants in these areas will hopefully be removed before they spread to undeveloped forested areas. An external source of funds must be obtained to support this effort.

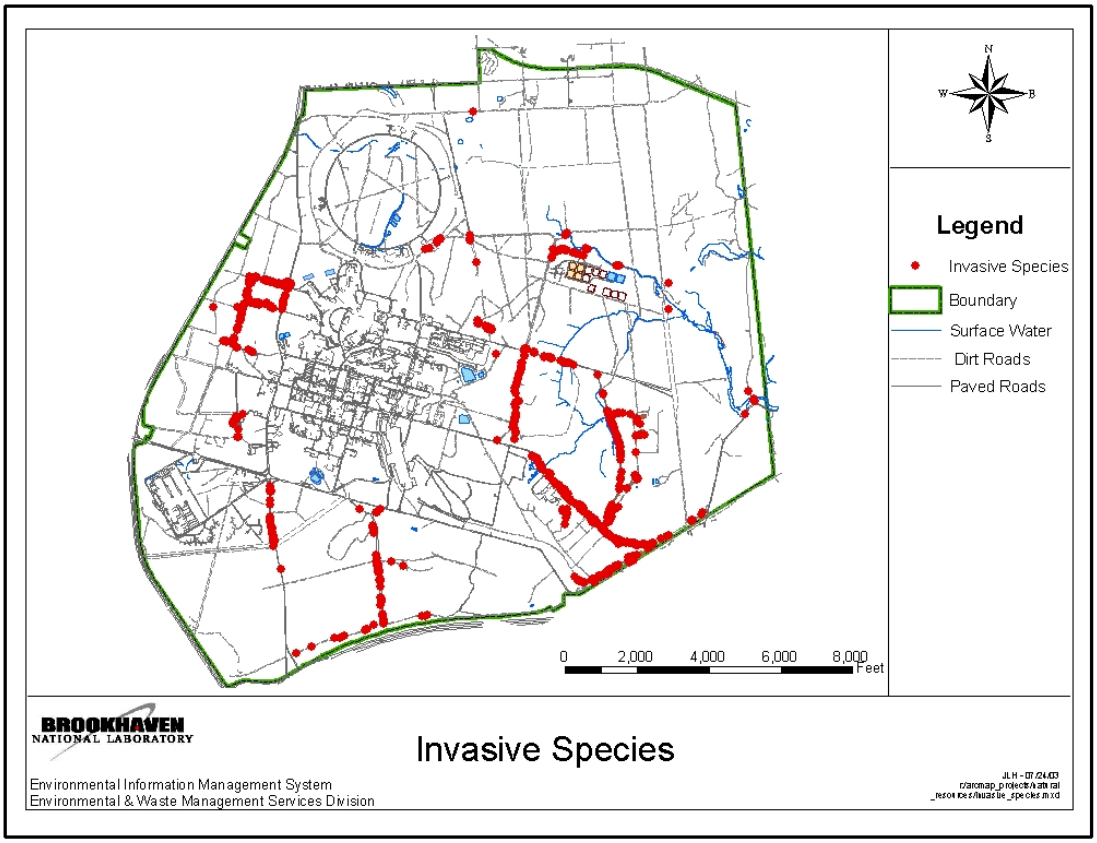

Figure 5. Distribution of invasive plant species on BNL.

3.13.2.4 Identify Funding Sources

One of the major issues for invasive species management is funding. In order to protect weed free areas, weeds that can be controlled need to be removed or controlled. Control often means removal and destruction of invasive plants using mechanical or chemical means. Both mechanisms can be expensive. The Natural Resource Management program is requesting budget increases and looking for other funding mechanisms.

3.14 Ecosystem Monitoring & Management

The Natural Resource Management program must still develop many of the monitoring protocols necessary for gathering information concerning the various habitats at BNL. With proper monitoring protocols decisions for management can be made and evaluation of management actions will allow changes to be made.

Late in 2003 the TAG, working with BNL and FWS, developed a recommendation that a contract for monitoring be put together. A call for proposals was submitted to potential contractors and proposals received. In 2004 a contract was established to develop specific monitoring protocols for the upland forest areas of the Lab and the rest of the Central Pine Barrens. The protocols are scheduled to be reviewed in April 2005 with implementation of monitoring to begin in June 2005.

3.14.1 Wetland Health Monitoring

There are over 26 coastal plain ponds, numerous vernal wetlands, large areas of red maple wetlands, and the Peconic River on site. Currently there are no protocols for obtaining standard information for most of these areas. Limited information is available and is collected on tiger salamander habitat, but more needs to be collected and a monitoring routine established so that the health of the BNL wetlands can be determined.

During the summer of 2004 two teachers associated with the Lab Science Teacher Professional Development program of the Science Education office participated in monitoring the chemistry of the coastal plain ponds. This effort is a two-pronged effort, one being to gather baseline chemistry data concerning many of the ponds onsite so that future comparisons with biotic distributions can be made. The second effort is to develop capacity through teaching local students how to do work in the coastal plain ponds in an outdoor classroom setting.

Future work on wetland health monitoring will involve gaining an understanding of the relationship between soil chemistry, water infiltration, and water chemistry of the ponds. This information will then be linked to distributions of organisms like dragonflies and damselflies as well as amphibians to begin developing monitoring protocols for freshwater wetlands.

3.14.1.1 Determine Functionality of BNL Central Wetlands

The large central wetlands at BNL are drained by a series of canals installed during WW-I and WW-II for mosquito control. The affect of this drainage may have resulted in less functional wetlands. Surveys and documentation on forest composition still need to be completed to determine if the wetlands are functioning like similar ones on Long Island.

3.14.1.2 Maintain or improve wetland functions

This action cannot be undertaken until wetland health monitoring and a determination on functionality is completed. Once the previous two actions are completed then plans for management of the wetlands can be made.

3.14.2 Forest Health Monitoring

Forest health monitoring was initiated in 2002 with the establishment of several deer exclosures in the Upton Reserve. These were visited in 2003 and 2004 with photo points established in order to track vegetation growth. Repeated entry into the exclosures was thought to cause structural damage to some of the vegetation due to trampling. Establishment of photo points allows documentation without trampling. Additional locations outside of the Upton Reserve need to be established to have sufficient documentation of all forest types at BNL.

3.14.2.1 Develop Criteria

Forest health criteria other than that developed for the deer exclosures was being developed through a contract established by the U.S. Fish & Wildlife Service and the Upton Reserve. The contractor is developing specific protocols that will allow the detection of change in several important factors found within the forests of the Central Pine Barrens. Once the protocols are developed they will be implemented across the entire Pine Barrens including onsite at BNL. The first collection of information is expected to occur during summer 2005.

3.14.2.2 Establish Forest Health Monitoring locations

Monitoring locations and the number of plots necessary is being determined by the contractor developing the various monitoring protocols for forest health.

3.15 Security

Several security issues were identified in the NRMP that need to be addressed. Most notably is the illegal use of ATVs and motorcycles on site, followed by other trespass issues regarding foot, bicycle, and horse traffic. While foot, bicycle, and horse traffic is illegal it generally does not result in significant damage to the ecosystem.

3.15.1 Illegal Use of ATVs

The northern and eastern most areas of the Laboratory including the Upton Reserve are subject to illegal trespass by individuals using ATVs and motorcycles. The historic use of these vehicles has resulted in areas of significant damage to both forest and wetlands.

In 2003, trees removed for the installation of a new rail spur were moved to the north firebreak and installed in areas subject to trespass access. The trees have been somewhat effective at minimizing access to the Lab property. However, the ingenuity of the trespassers continues to result in some damage along the northern portions of the Lab.

Safeguards and Security continue to support "sting" operations by the Suffolk County Parks Police, but these are few and far between. Additional measures and solutions to this problem must be developed.

In 2004, the Suffolk County Legislature established a task force to look into the need for a public facility that would allow the legal use of ATV's. By year's end the task force members had been selected and meetings were being planned. The task force is to determine if a public facility is needed and if it is, then suggest potential locations for the facility. A public facility may decrease the amount of illegal traffic utilizing the Lab, but will probably not eliminate it.

3.15.2 Other Trespass issues

Control of other trespass issues concerning foot, bicycle, and horse access must be addressed in the future.

3.16 Pesticide Use

Plant Engineering and Biology currently manage pesticide use on site using state requirements for application. The need for an SBMS Subject Area and discussions on appropriate use for natural resource management must still be completed.

3.16.1 SBMS Subject Area

This action, if deemed necessary, must still be initiated. Current practices follow all required regulations. If a subject area is needed, its development must be placed on the SBMS master schedule.

3.16.2 Use in Natural Resource Management

In the future the use of pesticides, primarily herbicides, will be necessary for control of invasive plants. Protocols for use and approvals must be developed.

3.17 Wildland Fire Management

BNL approved the Wildland Fire Management Plan for BNL in September 2003. This stand-alone plan is referenced in the NRMP since wildland fire and prescribed fire may have significant roles in natural resource management.

3.17.1 Implement Wildland Fire Management Plan

With the approval of the Wildland Fire Management Plan, its implementation began through development of a prescribed fire management plan for CY 2004. The draft prescribed fire plan was approved and implemented with the first BNL sponsored prescribed fire taking place during the annual Fire Academy in November 2004. In addition, readiness and coordination for wild fire was documented. Preparedness and

planning were in place and routinely practiced prior to formalization in the Wildland Fire Management Plan.

3.17.2 Implement Use of Prescribed Fire

As mentioned above the first prescribed fire plan was implemented in 2004. The first prescribed fire took place in November 2004 when approximately 7 acres of forest and grassed firebreak were burned. The purpose of the fire was to open up the understory canopy to facilitate oak regeneration. Both pre- and post fire monitoring took place and a second round of post-fire monitoring will be conducted in 2005.

3.18 Integration of Cultural Resources

Since BNL is on the site of WW I and WW II Camp Upton and the Depression Era Upton National Forest, several historic features are likely to exist. Work on the Cultural Resource Management Plan (CRMP) has identified some of the potential cultural resources that could be affected by natural resource management actions.

3.18.1 Identify Cultural Resources and Develop GIS layers

In 2003, several GIS layers concerning cultural resources were developed including creating maps of both WWI and WWII Camp Upton. The WWI map is particularly important, as cultural resource surveys have indicated the presence of foundations in several locations onsite. The WWI map layer has been matched up with existing roads and foundation locations that are now known. Also included as new layers in the GIS are locations of WWI trenches and 1850s homesteads. As additional work on the CRMP continues, new layers will be developed and referenced prior to making management decisions for natural resources. The area that was used for the first prescribed fire was surveyed for cultural resources prior to the burn taking place.

3.19 GIS and GPS

The Natural Resource Management program has integrated GIS and GPS into much of its management. GPS is routinely used to obtain location information of species, habitats and most recently the movement of species including eastern hognose snakes, spotted turtles, and box turtles. GPS information is entered into the GIS and new layers developed as necessary.

3.19.1 Develop Natural Resource data layers for GIS

New GIS layers for deer and bird survey routes have been developed. Layers for soils, state and federal jurisdictional wetlands have been obtained. Population density maps for deer have been developed, location of Natural Heritage elements are now within the GIS, and layers for trails, vegetation, and other resources continue to be developed. The GIS has been used to map home range information for all species that are being tracked with radio telemetry equipment. In 2005 the tiger salamander will be added to the list of species being tracked.

3.19.2 Plan Trails and paths that limit impact

The Lab is crisscrossed with deer trails, footpaths, and firebreaks. Many of the deer trails on the eastern edge of the Lab, in the Upton Reserve, are utilized for mountain biking, running, and hiking. Some of the paths are not suitable for some or all of these activities. Some of the trails have been mapped while others still need to be mapped. Once the trails have been mapped and evaluated, a plan for appropriate use must be developed. As time permits additional trails will be mapped. In 2004, portions of former roads were mapped to incorporate them into both the natural resource layers as well as the cultural resource layers. The mapped roads are apparent on maps that date back to at least the 1850s.

3.19.3 Fill data gaps concerning flora and fauna

Work to fill data gaps concerning flora and fauna found on the BNL site is a continual process. Through the efforts of Upton Reserve staff, interns, and BNL staff, documentation for several species has taken place in 2004. Filling data gaps is documented throughout this annual report in earlier sections concerning endangered, threatened, and species of special concern, reptile and amphibian studies, and Odonate studies as examples.

3.20 Education Programs

In 2004, the Natural Resource Management program and the Upton Reserve hosted six undergraduate research interns, and two teachers all working on various projects. These interns completed work on tiger and marbled salamanders, radio telemetry work on hognose snake, spotted turtles, turtle inventory, inventory of Odonate species, rescue of animals from the Peconic River, documentation of success of restoration plantings, and water chemistry of selected wetlands.

Each intern was responsible for their own research as well as assisting each other in the collection of data. Results of the research were presented in a poster session sponsored by the Office of Education Programs, and the research was also presented at a poster session at the Pine Barrens Research Forum.

All students and BNL staff participated in the BNL Science Museum's Summer Camp program. Each week, camp participants met on Thursday at the Weaver Rd. pond to learn about soils and water. Each intern also presented their research to the campers. These lessons introduced students in grades 4 –6 to the various research topics, and gave the student interns an opportunity to learn teaching skills.

3.21 Research

Research carried out in 2004 through funding from the Upton Reserve included: Nutrient cycling after prescribed fire; Effects of prescribed fire on myccorhizal assemblages in pine barrens habitats; Invasive woody vines and questions on effects of herbivory; and Factors affecting successful growth of invasive plants in the pine barrens. In addition

contracts to develop a research database and monitoring protocols were established with results expected in early to mid- 2005.

3.21.1 Identify, attract, and support ecological research to BNL

Researchers from SUNY Binghamton initiated tiger salamander research during July and August of 2004 to gather preliminary information prior to starting a full project in 2005. This group will investigate the population dynamics and habitat needs of the eastern tiger salamander over a two to three year period.

The Foundation for Ecological Research in the Northeast is also looking into funding mechanisms for research that would largely occur at BNL for the foreseeable future. FERN submitted two grant proposals to the Aid to State Wildlife program but were unsuccessful in procuring funds. However, FERN has received a promise of funding through the Environmental Protection Fund with $100K designated by the NY legislature, and the Brookhaven Science Associates board made a commitment of $25K. Additional funding sources are being sought by FERN.

3.22 NRMP Plan Update

Since the NRMP was completed in December 2003 it will not require a complete update until 2008 (five years). However, in the preparation of the first annual report, Appendix C of the NRMP was rearranged to facilitate reporting requirements. The modified version of Appendix C is attached. In addition, if new actions are identified they will be appended to the Appendix C Actions Table in the future.

This report once completed will be provided to the TAG for review and any suggestions or new actions arising from that review will be incorporated into the Actions table.

APPENDIX C

NATURAL RESOURCE MANAGEMENT PLAN – ACTION ITEMS

Action Item	Site ID	Action	Planned Date	Action Taken
1	*Site-wide	Transition WMP Action into NRMP	December 2003	Complete
2	Site-wide	Annual Summary Report	Annual by March 31	Ongoing
3	Site-wide*	TAG Review of Annual Report	Annual by May	
4	Site-wide*	Adapt Management based on new information	As Required	1st annual report 3/31/04, ongoing
5	Site-wide*	Improve decision making through use of innovative tools	As Necessary	Implemented 2003, ongoing
6	Site-wide*	Maintain and Improve relationships with stakeholders	Continual	Ongoing
Peconic River/Basins				
7	Peconic River Station HMn	Monitoring for flow: water quality	Monthly sampling SPDES Program	Ongoing
8	Fish Sampling Peconic River	Fish sampling with NYSDEC/Cold Spring Harbor: population assessment of banded sunfish and swamp darter	Annual Spring/Summer	Ongoing
9	TS-7	Monitoring for water quality	Monthly sampling SPDES Program	Ongoing
Deer Management				
10	*Site-wide	Issue and Discussion Paper on deer management by Natural Resource Manager	Fall 2003	In process, delayed for regional approach
11	*Site-wide	Environmental Assessment under NEPA for deer management		Delayed for regional approach
12	*Site-wide	Implement Deer Management		
13	Site-wide	Deer population estimation	Nov-Jan May-June	Routine estimates made twice a year, new protocol developed in 2004
Special Status Species				
14	*Site-wide	Maintain Special-status species list	Annual Review	Ongoing
15	*Site-wide	Identify habitats of special-status species	Continual	Ongoing
Tiger Salamander				
16	Site-wide	TS annual egg mass surveys at breeding ponds	Feb-April 2003	Ongoing
17	Site-wide	TS Larval Survey	Annual June-July	Ongoing
18	Education	Provide educational material or opportunities to BNL staff and public on environmental issues	Continual	Ongoing
19	*RHIC	New pond being added at RHIC	Summer 2004	Planting native vegetation to be completed
20	Tiger salamander	Set up cover boards around one breeding site (as a test case)	Summer	Summer 2001 & 2002, completed, drift fences installed

APPENDIX C

NATURAL RESOURCE MANAGEMENT PLAN - ACTION ITEMS

(continued)

Action Item	Site ID	Action	Planned Date	Action Taken
21	TS-A7	Lining of pool ER program	Aug 2003	Completed
22	TS-W6b	Pond Remediation ER program	2004-2005	In Progress
Banded Sunfish				
23	OU V	Peconic River Remediation Program	Spring 2004	In Progress
Frosted Elfin				
24	*Habitat Specific	Confirm presence/absence of Frosted Elfin	May-June Annually	Ongoing
25	*Habitat Specific	Establish standard monitoring protocols for the Frosted Elfin		
26	*Species Specific	Maintain and Enhance habitat for the Frosted Elfin	Continual	Ongoing
27	*Site-wide	Habitat assessment for lupine	Spring 2004	Ongoing
Habitat Enhancement/ other species				
28	Site-wide	Bird nests/boxes	Ongoing	Routine monitoring and maintenance of bluebird, kestrel, wood duck nest boxes
29	*Site-wide	Develop survey methodology to document all biota on BNL	2004	Contract through Upton Reserve
30	Site-wide	Monitor Canada Goose and Wild Turkey populations	Ongoing	
31	Site-wide	Turkey sighting reports to NYSDEC	Ongoing	Reports sent annually in September
32	Site-wide	Song bird surveys	April – Sept.	Continuing
33	*Site-wide	Odonata Surveys	Summers	Initiated 2003
34	*Site-wide	Reptiles and amphibian Surveys	Ongoing	Reptiles & Amphibians started 2003
Population Management				
35	*Site-wide	Manage Canada Goose population	As necessary	
36	*Site-wide	Manage Wild Turkey population	As necessary	
37	*Site-wide	Establish BNL policy on feral animals		
38	*Site-wide	Establish monitoring and management protocols for feral animals	Fall 2003	Initiated
Vegetation Management				
39	*Site-wide	Establish protocol for use of native vegetation		
40	*Site-wide	Use native vegetation on restorations and new construction landscaping	As necessary and applicable	Initiated 2003
41	RHIC Revegetation	Implement Revegetation	Ongoing	Grasses planted 2002 and 2003

APPENDIX C

NATURAL RESOURCE MANAGEMENT PLAN - ACTION ITEMS

(continued)

Action Item	Site ID	Action	Planned Date	Action Taken
42	*Site-wide	Establish policy and procedure for cutting trees		
Invasive Species				
43	*Site-wide	Identify and monitor distribution of invasive species.	Ongoing	Mapping started Summer 2003
44	*Site-wide	Establish volunteer "Weed Watchers" group	Ongoing	Group formed May 2003
45	*Site-wide	Removal or control of invasive plants where possible.	As necessary	
46	*Site-wide	Identify funding for removal or control of invasive plants where possible.	As necessary	
Ecosystem Monitoring and Management				
47	*Site-wide	Develop criteria to monitor wetland health		
48	*Site-wide	Determine functionality of BNL Central wetlands		
49	*Site-wide	Maintain or improve wetland functions		
50	*Site-wide	Develop criteria to monitor forest health	Fall 2004	
51	*Site-wide	Establish forest health monitoring locations	Summer 2005	
Security				
52	*Site-wide	Coordinate with Security to reduce illegal use of ATVs	Continual	Ongoing
53	*Site-wide	Other trespass Issues		
Pesticide Use				
54	*Site-wide	Determine need for a SBMS subject area on pesticides	As necessary	
55	*Site-wide	Pesticide use for natural resource management		
Wildland Fire Management				
56	*Site-wide	Implement Fire Management Plan	Sept. 2003	Plan Approved September 2003
57	*Site-wide	Implement use of prescribed fire and mechanical fuel reduction	March 2003	1st Fire November 2004
Cultural Resource Management				
58	*Site-wide	Identify cultural resources and develop into GIS layers	Ongoing	
GIS and GPS				
59	*Site-wide	Develop natural resource data layers of GIS	Ongoing	
60	*Site-wide	Plan trails and paths that limit impact on the environment while introducing employees to forest diversity.		

APPENDIX C

NATURAL RESOURCE MANAGEMENT PLAN - ACTION ITEMS

(continued)

Action Item	Site ID	Action	Planned Date	Action Taken
61	*Site-wide	Fill data gaps concerning all flora and fauna, including the following: terrestrial and aquatic invertebrates, Lepidoptera, wild flowers, and grasses.	Ongoing	
62	Site-wide	Education Programs	Ongoing	Utilize Office of Education Programs Interns, etc.
	Research			
63	Site-wide	Cooperate with Upton Reserve, support and conduct research as needed	Ongoing	Assisting Upton Reserve in coordinating research programs
64	*Site-wide	Identify, attract, and support ecological research at BNL	Ongoing	
65	Site-wide	NRMP Plan Update	Every 5 years	---

Notes: * New initiative

ER – Environmental Restoration
GIS – Geographical Information System
NEPA – National Environmental Policy Act
NYSDEC - New York State Department of Environmental Conservation
NRMP – Natural Resource Management Plan
OU V – Operable Unit V
RHIC - Relativistic Heavy Ion Collider
TS – Tiger Salamander